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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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JUN 29 2007

In re Application of:

Joseph R. Summa

**OPTIMIZATION OF CCD
MICROLENS SIZE FOR COLOR
BALANCING**

Serial No. 09/821,151

Filed 29 March 2001

Group Art Unit: 2622

Examiner: Nguyen, Luong Trung

I hereby certify that this correspondence is being
facsimile transmitted to the United States Patent
and Trademark Office, fax number 571-273-8300, on
June 29, 2007.

Joseph R. Summa

Joseph R. Summa

6-29-2007
Date

Commissioner for Patents
P.O. Box 1450
Alexandria, VA. 22313-1450

Sir:

DECLARATION UNDER 37 CFR 1.131

I, Joseph R. Summa, hereby declare:

1. I am the sole inventor of the invention claimed in United States Patent Application 09/821,151;
2. I included a description of the subject invention in my engineering notebook on March 16, 2000 (see attached Appendix A);
3. I prepared an invention summary for the subject invention on March 17, 2000 and submitted the invention summary to Kodak's internal review process to obtain business unit authorization (see attached Appendix B);
4. I was notified on April 25, 2000 by the Patent Legal Staff that a Kodak docket number had been assigned and that the responsible attorney would be James D. Leimbach (see attached Appendix C);
5. On information and belief, the invention summary for the subject invention was transferred to different attorneys within Kodak for preparation

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during the time period of April 25, 2000 to September 30, 2000 (see previously submitted Declaration by Attorney Peyton C. Watkins);

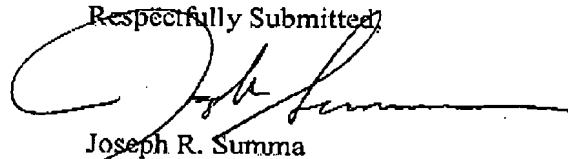
6. To the best of my recollection, I met with Attorney Peyton C. Watkins on at least two occasions during the time period of October 1, 2000 to March 29, 2001 to prepare the patent application for the subject invention;

7. I signed a Combined Declaration for Patent Application and Power of Attorney entitled "Optimization of CCD Microlens Size for Color Balancing" for United States Patent Application 09/821,151 on March 27, 2001; and

8. United States Patent Application 09/821,151 was filed on March 29, 2001.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectfully Submitted,



Joseph R. Summa

Appendix A

Correspondence Number 3

Optimization of CCD Microlens Size for Color Balancing

Joseph R. Summa

Field of Invention

This invention relates to electronic imaging, and in particular the color sensitivity of individual pixels in a CCD.

Background of Invention

The responsivity of a CCD typically varies with the wavelength of the incident light. This variation is caused by a variety of factors including the gate electrode and dielectric stack, color filter non-idealities, and the sensitivity of the silicon itself. Typically, the spectral response of a CCD peaks in the green and is lowest in the blue. There is also much less blue light available in typical scenes making larger sensitivity to blue light desirable. This invention preferentially directs portion of the light that would otherwise be captured by pixel with high responsivity onto a pixel with lower response and thus permit optimization of the total spectral sensitivity of the device.

Summary of the Invention

Microlens arrays deployed on CCDs are typically sized identically for each color and match the dimension (less the gap between lenses) of the underlying pixel. By uniquely sizing the microlenses over each color, (and expanding outside the bounds of the underlying pixel if necessary), the spectral response of the device can be customized.

Advantages over Prior Art

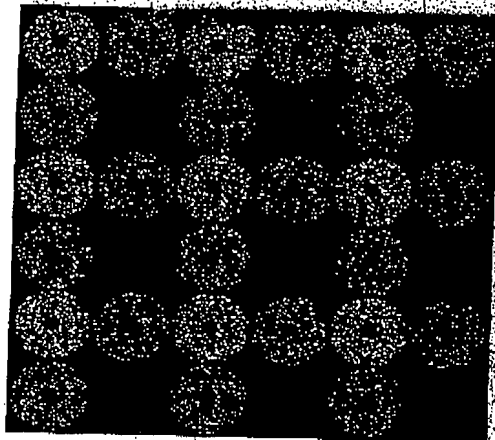
- * Improved color balance without significant loss of light
- * Improved blue response
- * Less sensitivity to lens inefficiencies when applied to a full frame CCD

Detailed Description of the Invention

A typical lens array is shown in figure 1. An example of a resized lens array is shown in figure 2. In the (somewhat exaggerated) case shown, an oversized blue lens focuses a percentage of the light that would have been collected in the green pixel using the standard design in figure 1. This additional light can be used to compensate for spectral sensitivity differences. Due to changes in the curvature of the lens as function of lens size, not all lenses will focus light on the substrate with equal efficiency. When applied to an interline CCD with a narrow photodiode, this will reduce the quantum efficiency of these pixels, but still improve color balancing. In the case of full frame image sensors (where the entire pixel is photosensitive), these losses (if any) will be much less severe since the diameter of the focus spot of the lens is less critical.

Appendix A

Notebook Number 6



Top View

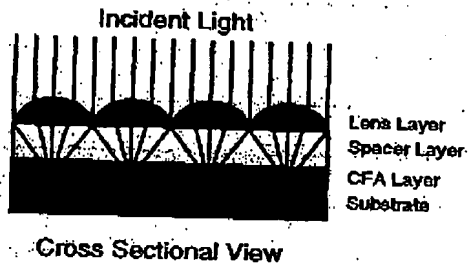
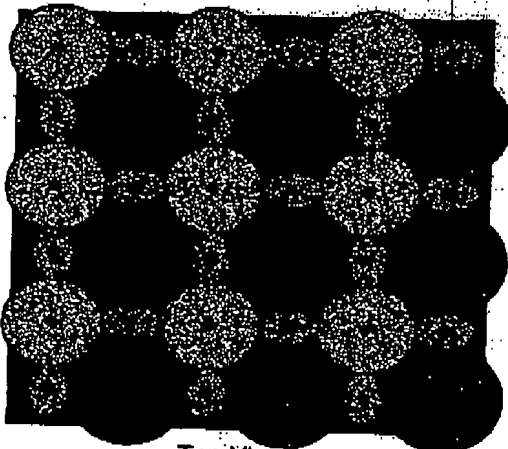


Figure 1



Top View

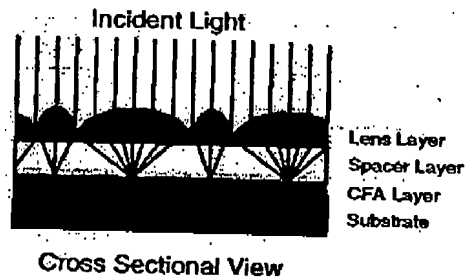


Figure 2

Signature: *[Signature]*
Date: 05/16/2007

Read and Understood By: *[Signature]*
Signature: *[Signature]*
Date: 05-16-07

Appendix B

Optimization of CCD Microlens Size for Color Balancing

Joseph R. Summa

Field of Invention

This invention relates to electronic imaging, and in particular the color sensitivity of individual pixels in a CCD.

Background of Invention

The responsivity of a CCD typically varies with the wavelength of the incident light. This variation is caused by a variety of factors including the gate electrode and dielectric stack, color filter non-idealities, and the sensitivity of the silicon itself. Typically, the spectral response of a CCD peaks in the green and is lowest in the blue. There is also much less blue light available in typical scenes making larger sensitivity to blue light desirable. This invention preferentially directs portion of the light that would otherwise be captured by pixel with high responsivity onto a pixel with lower response and thus permit optimization of the total spectral sensitivity of the device.

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Advantages over Prior Art

- * Improved color balance without significant loss of light
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- * Less sensitivity to lens inefficiencies when applied to a full frame CCD

Detailed Description of the Invention

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Examples of Prior Art:

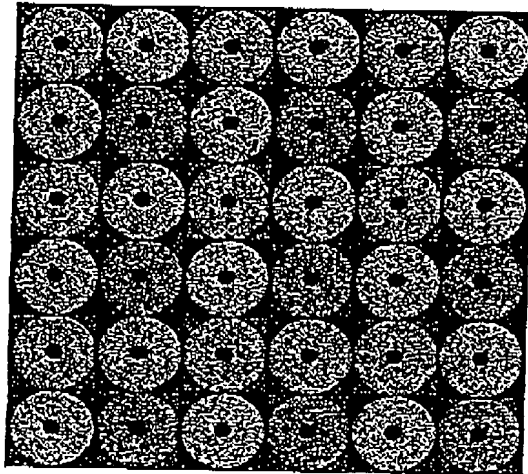
US PAT. 4,667,092 ← USE OF LENSLETS

US PAT. 6,001,668 ← ITO² SENSOR W/ MENTION OF LENSLET TO FOCUS LIGHT INTO ITO PHASE
(KODAK)

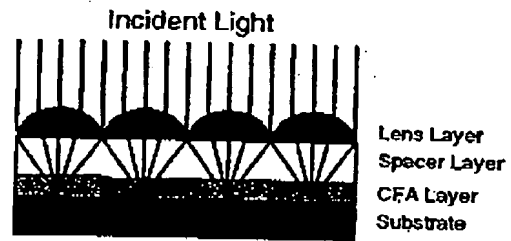
8/17/2007: H. J. Summa
3/17/2008: J. R. Summa

Appendix B

Attachments

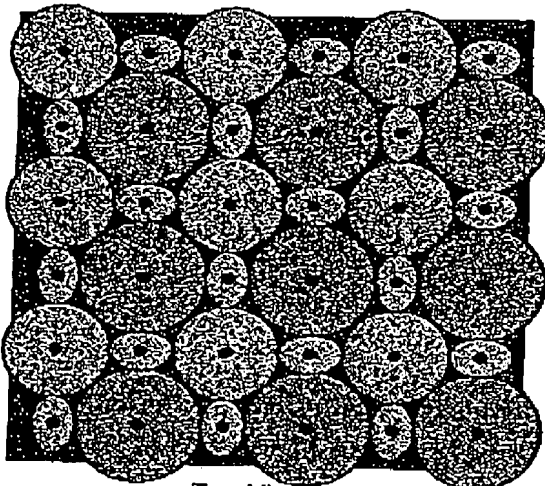


Top View

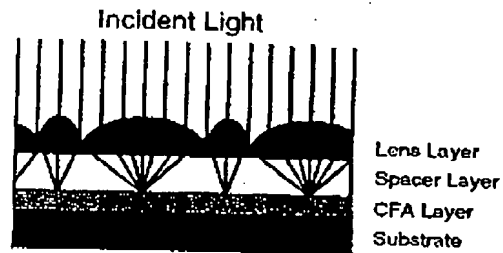


Cross Sectional View

Figure 1



Top View



Cross Sectional View

Figure 2

3/17/2000 *[Signature]*

Lois A. Massar 04/25 JO 02:03:36 PM

Appendix C

REDACTED

To: Joseph R Summa/470596/EKC@Kodak
cc: David N. Nichols/121334/EKC@Kodak, James D. Leimbach/484573/EKC@Kodak (bcc: Lois A. Massar/315487/EKC)
Subject: Docket Assignment - Docket No. 81017/JDL
From: Lois A. Massar

SUBJECT: Newly Received "KODAK Invention Disclosure"
Titled: "Optimization of CCD Microlens Size For Color Balancing"
Inventor(s): Joseph R. Summa
Docket No.: 81017/JDL

The above-identified "KODAK Invention Disclosure" has been assigned to James D. Leimbach for handling.

The Patent Department Docket No. indicated above should always be used when corresponding to us regarding this invention disclosure.

When you are ready to discuss the patentability of this invention, please contact me and I will schedule a meeting between you and Mr. Leimbach. If you have any questions or concerns, please contact either Mr. Leimbach (x-29021) or myself (x-29711). Also, please keep us informed of any significant changes in the invention or plans to use the invention.

Thank you.

Lois A. Massar

Patent Legal Staff, 14/83/RL, MC-02201, x-29711
Patent Legal Assistant to James D. Leimbach